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(6) ATMOSPHERIC INFRARED OPTICS - FLUX MEASUREMENTS

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ATMOSPHERIC INFRARED OPTICS - FLUX MEASUREMENTS

Block Associates, Inc. Cambridge, Mass.
Contract AF 19(628)-210

Semi-Annual Report #3

Period: 1 July to 31 December 1962

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ABSTRACT

A balloon-borne experiment to measure the upward and downward atmospheric radiance is described. The instruments used were two infrared interferometer spectrometers, Block Associates, Inc. Models I4T and I4TC, the I4T looking alternately at the nadir and zenith while the I4TC looked continually at the nadir.

1. Introduction

This contract is for the study, calibration, and immediate use of Block Associates, Inc. interferometer spectrometers (Model I4T for the spectral range 1.5 to 15 microns and Model I-4TC for the range 4 to 40 microns) for measurement of the radiance in the atmosphere.

The current work is a continuation of the development which, from the inception of the idea of a small interferometer spectrometer, has been underwritten by a succession of contracts of which AF19(628)-210 is the latest.

Experiments accomplished and to be undertaken are both ground-based and balloon-borne. From the latter, data will be obtained on radiance received from the sky in varying directions from horizon to zenith, and from the earth from nadir to horizon. These measurements will be taken at altitudes varying from sea level to about 100,000 feet. From the experience gained in working with the interferometer spectrometers, information on stability, accuracy of radiance measurements, resolution of the spectrum, adequacy of the supporting electronic devices, and the most efficient methods of data reduction will be obtained. The calibration procedures involved a variety of comparisons using both in-house instruments as well as monochrometers and spectrometers operated by independent outside laboratories.

During the period covered by this report the effort on this contract was limited by the lack of funds and the work was stopped.

2. Balloon-Borne Experiment

The major accomplishment during this period was the balloon flight of 1 August 1962. The purpose of this flight was to gather data regarding the upward and downward radiative energy flux in the atmosphere. For this purpose two interferometer spectrometers were used, one, an I4T, looking alternately at the nadir and at an angle of 20° to the zenith, covered the 1.5μ to 15μ spectral region while a second instrument, an I4TC, looking only at the nadir, covered the 4μ to 40μ spectral region.* Also on board were four experimental frost point hygrometers supplied and serviced by Minneapolis-Honeywell. The telemetry system used for data transmission during the flight was supplied by Northeastern University, who also fabricated the gondola.

The balloon was launched at 1:27:30 A.M. Mountain Standard Time. The flight proceeded normally until the balloon reached an altitude of 54,000 feet M.S.L. at which point it burst; the cause is uncertain but the tropopause was extremely cold. At this point the mission was terminated and the payload was parachuted back to earth. See Figure 1.

Both spectrometers operated as expected and although the flight was terminated before the balloon had reached float altitude all the data obtained up to that point were valid due to the high spectral sampling rate.

Engineering information regarding the performance of the

* For a detailed description of rht instrumentation, theory of operation and calibration procedures see "Atmospheric Infrared Optics - Flux Measurements" Contract AF 19(625)-210, Semi-Annual Report #2, Period 1 January to 30 June 1962.

instrumentation was also gathered and some of the most significant data is presented in Figure 2.

Due to the lack of funds, as of this writing, the spectral data have not been reduced. However, a cursory inspection of the data shows that it is reasonable.

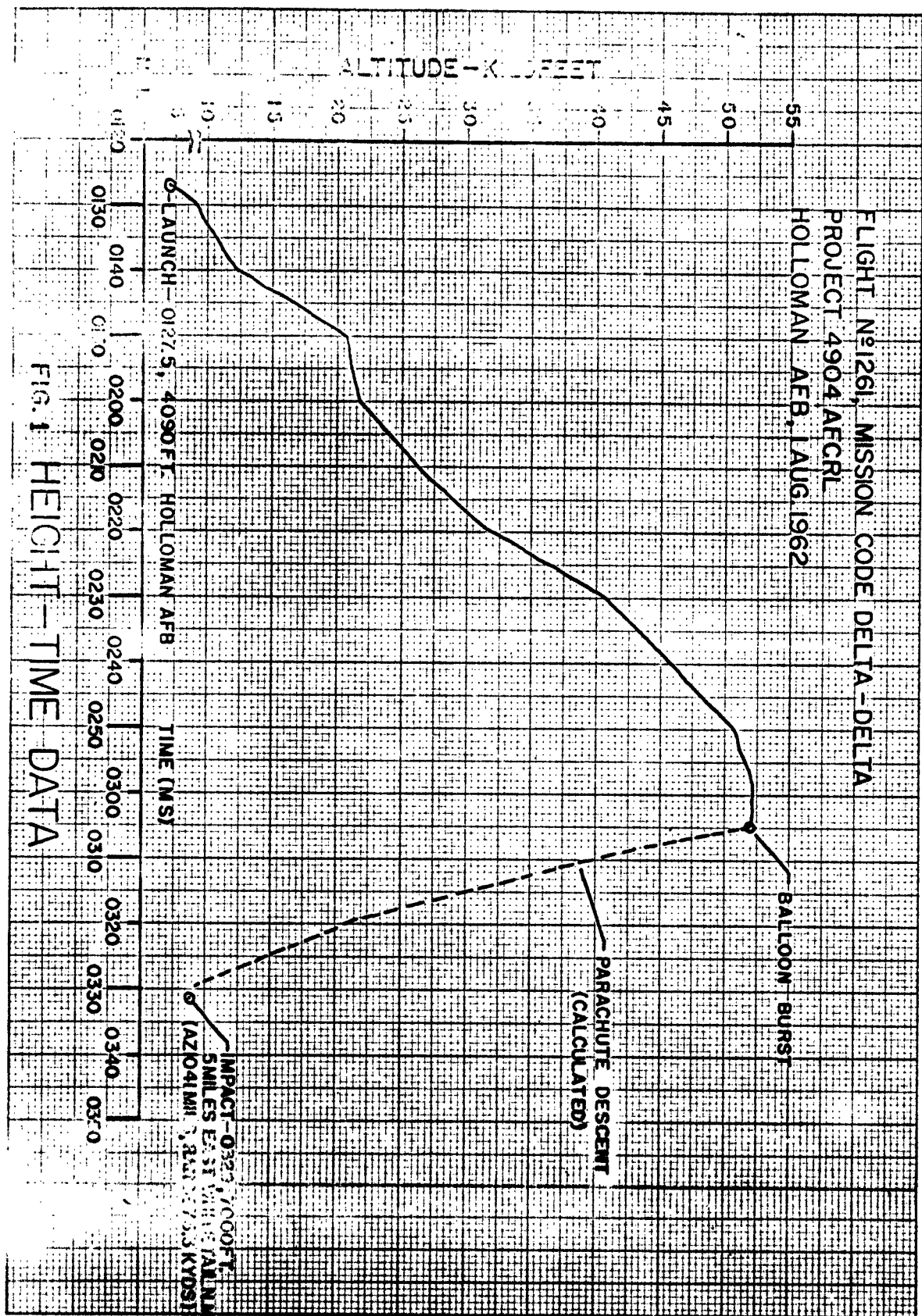


FIG. 1 HEIGHT-TIME DATA

FIG 20-1-4T TEMPERATURES

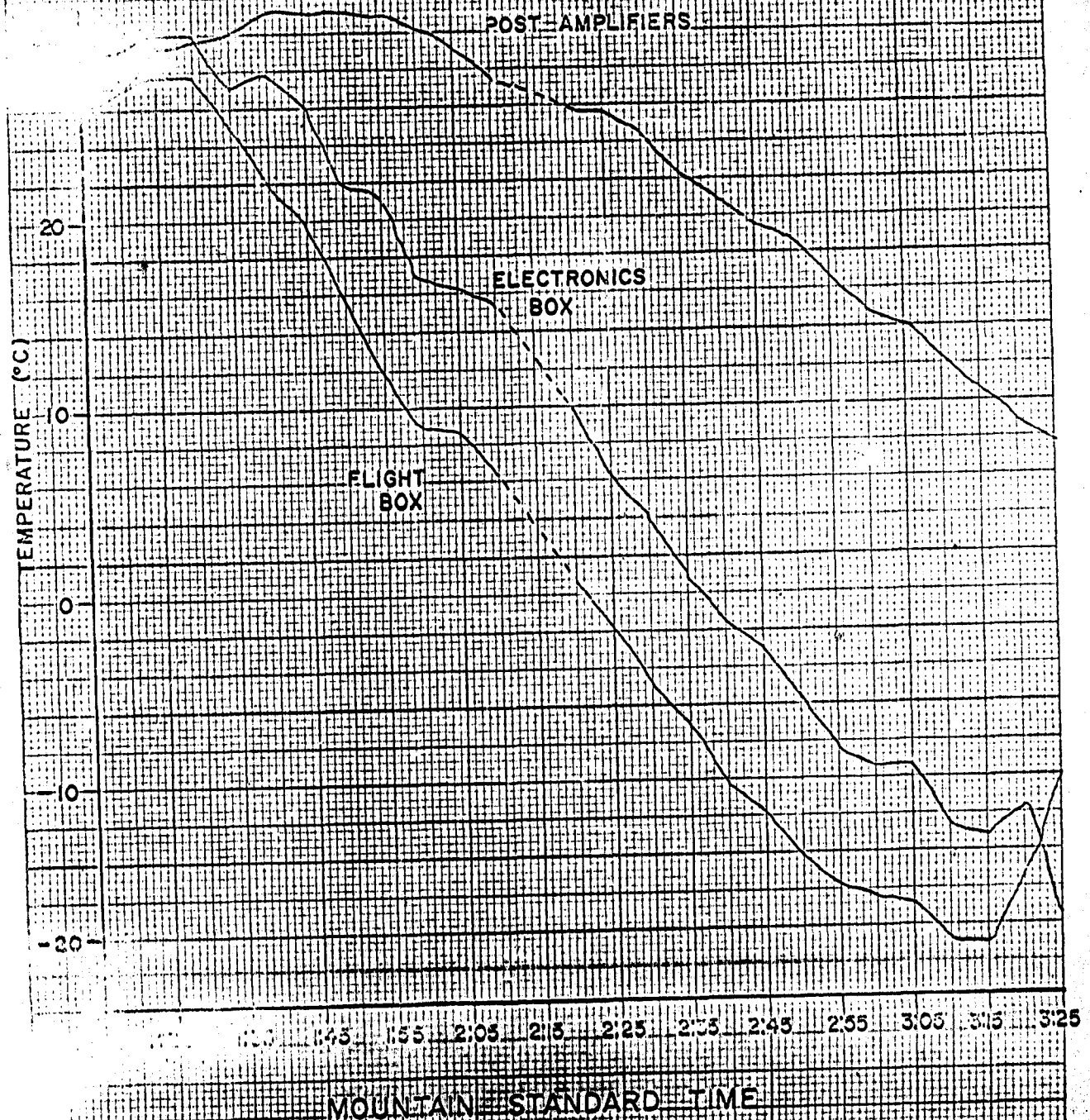
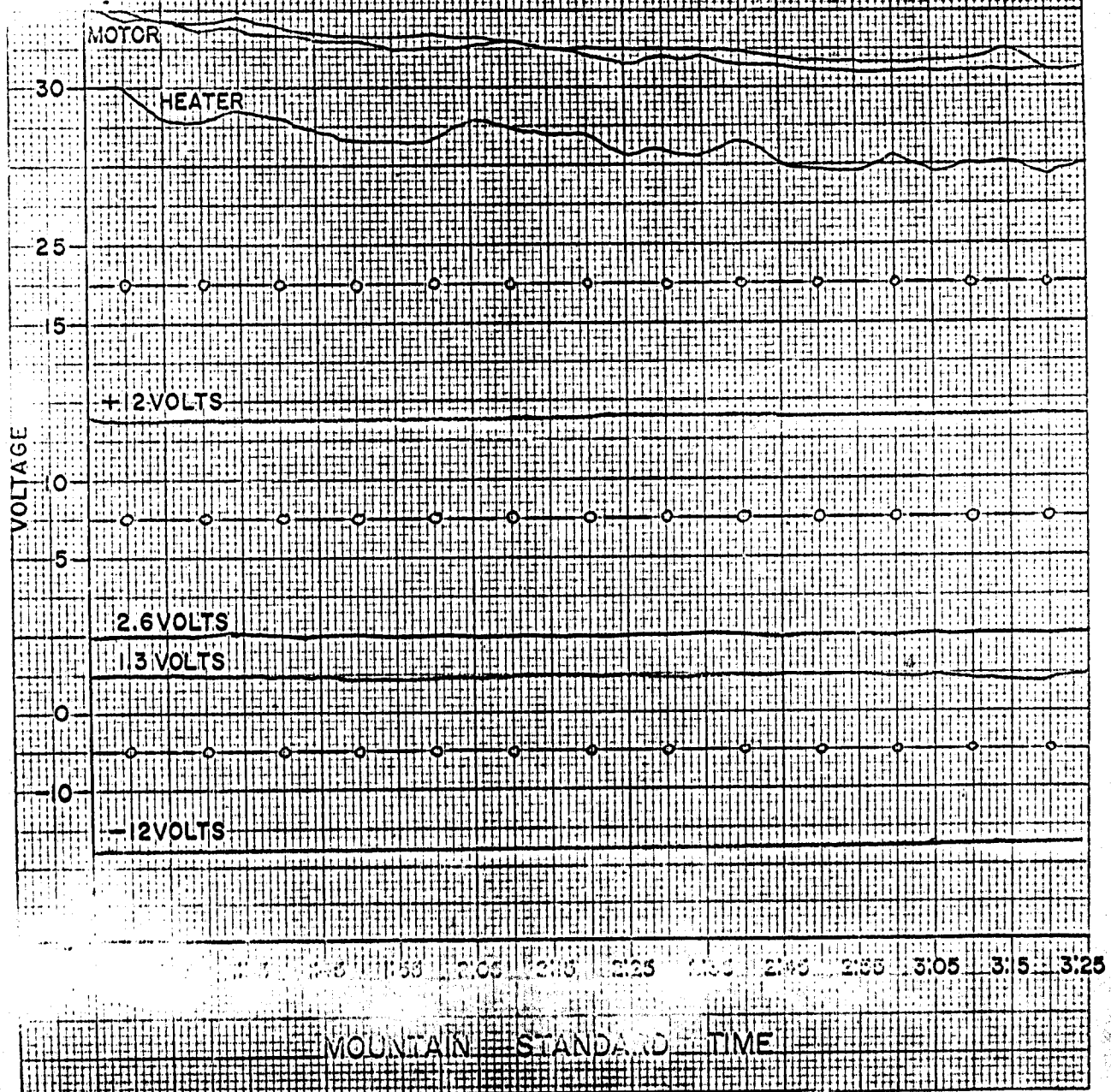
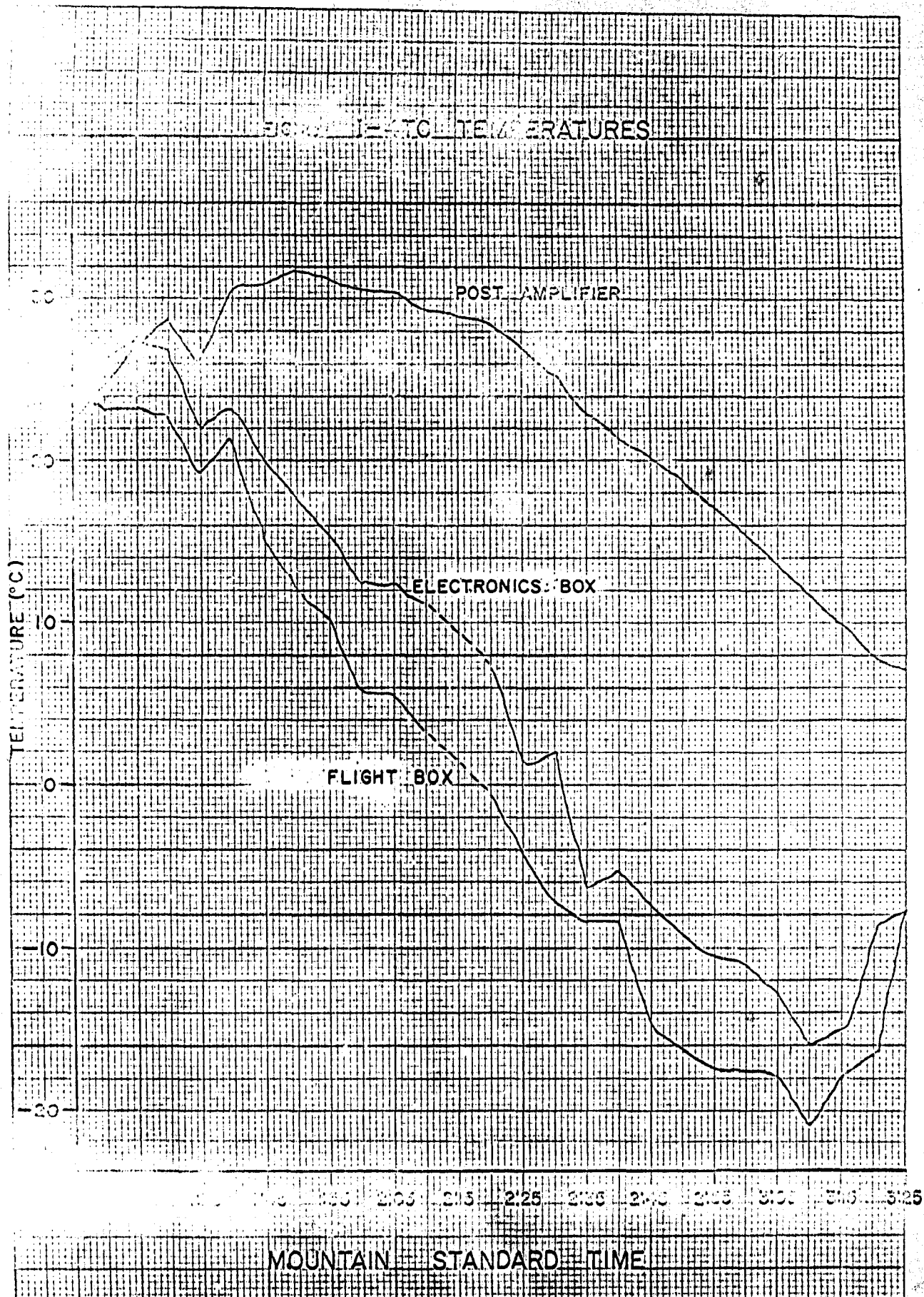
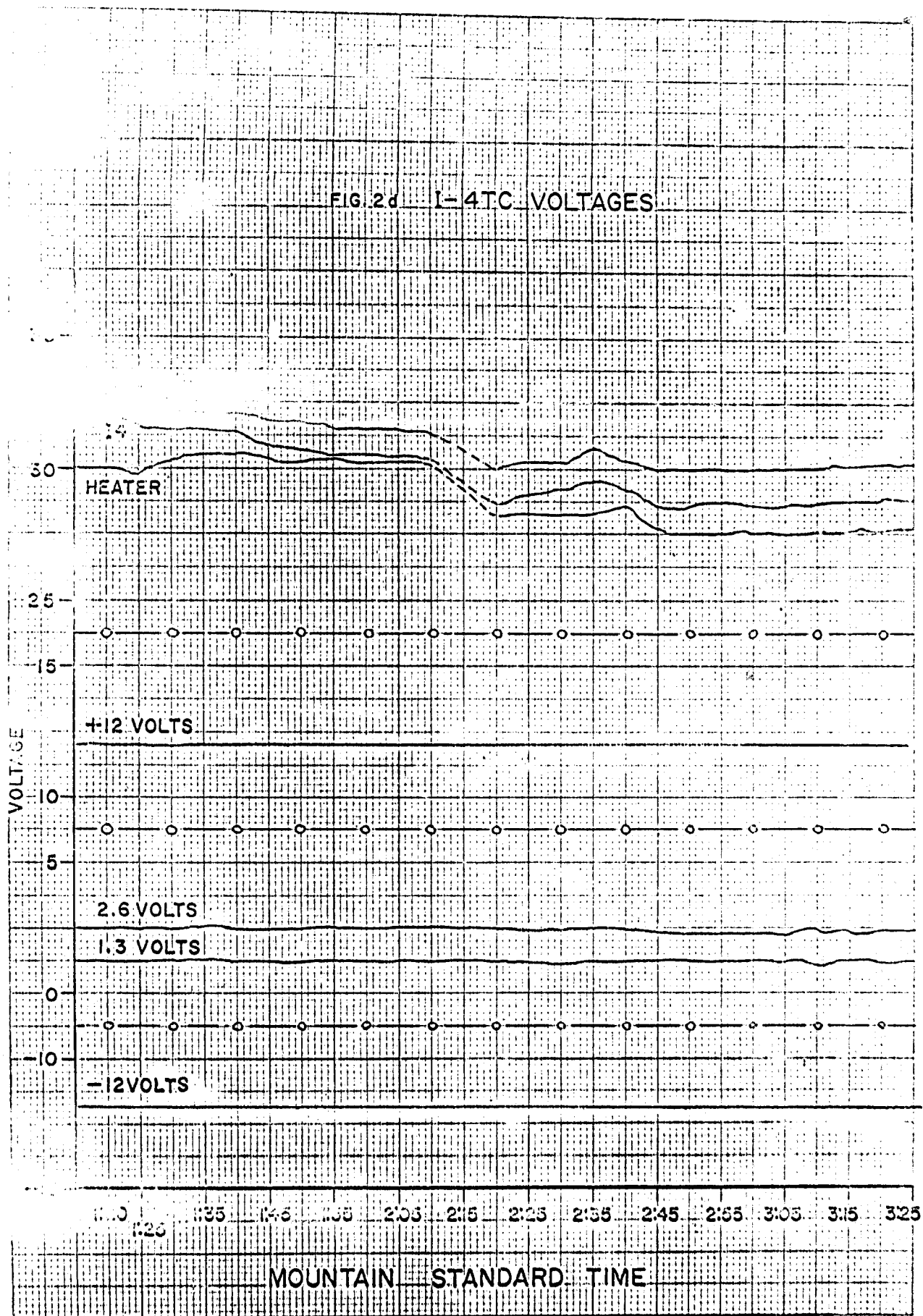


FIG. 2b - J-4.T. VOLTAGES







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